Accuracy and Area

General Mathematics - Preliminary

Name: _____

Scientific Notation

Do you know this number, 300 000 000 m/sec.? It's the Speed of light!

Do you recognise this number, 0.000 000 000 753 kg. ? This is the mass of a dust particle!

Scientists have developed a shorter method to express very large numbers. This method is called **scientific notation**. Scientific Notation is based on powers of the base number 10.

The number 123 000 000 000 in scientific notation is written as 1.23×10^{11}.

The first number 1.23 is called the **coefficient**.
It must be **greater than or equal to 1** and **less than 10**.

The second number is called the **base**. It must always be 10 in scientific notation. The base number 10 is always written in exponent form (index form). In the number 1.23×10^{11} the number 11 is referred to as the exponent or power of ten.

Significant Figures

Every measurement has a degree of uncertainty. The number of reliably known digits in a number is called the number of **significant figures**. For example the radius of the earth is 695 000 000 m. This number is not exact but has been "rounded off" to the nearest million metres. We say the number has three **significant figures**. The zeros at the end of this number are "not significant".

In some numbers zeros are significant, eg In a measurement stated as 605mm the zero is significant. The rules for determining the number of significant figures are as follows:

- **All** non-zero digits are significant
- Zeros **between** non-zero digits are significant
- Zeros at the **end** of a decimal are significant – **WHY?** Because the trailing zeros report a greater precision than the measuring equipment supports eg 6.500m denotes that the measure of accuracy was to the nearest mm (0.001m).
- All other zeros are not significant but could be be counted as.

Using these rules 65.00 has four significant figures but each of the numbers 65, 6500, and 0.0065 has only two significant figures.

eg Round the following numbers to the number of significant figures given in the brackets.

(a) 96 302 (2 significant figures)

(b) 54.918 (4 significant figures)

(c) 0.003702 (3 significant figures)

(d) 561 045 (3 significant figures)

(e) 8.007 (1 significant figure)

(f) 23 654 067 (5 significant figures)

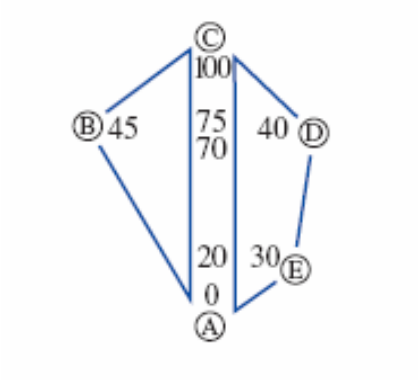
(g) 0.030048 (4 significant figures)

eg Evaluate $\sqrt[4]{\dfrac{(7.96)^8}{(5.78-2.44)^2}}$ and express your answer in scientific notation correct to two significant figures.

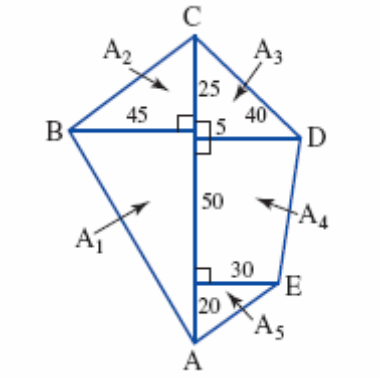
Field Diagrams

Surveyors are often required to draw scale diagrams and calculate the area of irregular shaped blocks of land. This is done using a **traverse survey.**

A **field diagram** is often used to make a scale drawing of the land.



The diagram is then split into triangles and quadrilaterals and the area calculated.



eg Use the field diagram to complete:

a) a scale drawing (1mm = 1m)

b) calculate the area of the field.